REKK Regional Centre for Energy Policy Research

South East European Electricity Roadmap (SEERMAP)

Belgrade
22-23 September 2016

Goals of the project

REKK Regional Centre for Energy Policy Research

Modelling

- Analyse the impact of the transition to a low carbon and energy secure pathway the electricity sector until 2050 in line with EU 2050 Roadmap (*Long Term Electricity Roadmap for the SEE region*) that highlights the potential synergies beyond the limited confines of national assessments
- Application of state of the art energy sector models of the participating consortia partners (electricity and gas sector market models of REKK, Green-X of Technical University of Vienna and the regional electricity network model of EKC)

Dialogue and capacity building

- Effectively distribute the findings of this roadmap to the high level decision-makers in the energy administration of the countries
- Build up capacities – in the form of training courses - amongst policy makers, TSO members, energy regulators and local think tanks in the field of renewable energy deployment and transmission network planning issues
- Build up a network of regional think tanks capable of contributing to the debate on the long term decarbonisation pathways in the SEE region
- Trigger discussions on electricity scenarios at a national level

Basic data

Project title	South East European Electricity Roadmap	
Country/region of implementation	Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, F. Macedonia, Serbia, Romania, Bulgaria, Greece	
Project cycle:	July 2016	June 2017
Donors:	Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management	MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH
	European Climate Foundation	European Climate Foundation

Project partners

- Regional Centre for Energy Policy Research (REKK) Budapest, Hungary – overall coordination, electricity and gas sector modelling
- Technical University (TU Wien) Vienna, Austria – Renewable deployment modelling with GREEN-X model
- Electricity Coordinating Centre (EKC) Belgrade, Serbia – Network modelling
- OG Research (Czech Republic) – Macroeconomic assessment
- Energy Regulators Regional Association (ERRA) - Trainings

+ 9 local Think Tanks contracted by REKK and ECF - Contribution to scenario development and mobilisation of and liaising with local decision makers

+ Steering Group tasked with checking progress of project execution bimonthly and proposing changes and adjustments (including representatives of ECF and Agora Energiewende)

Local partners

REKK Regional Centre for Energy Policy Research

Country	Local partner organisation
Serbia	RES Foundation
Albania	POLIS University
Macedonia	MACEF – Macedonian Center for Energy Efficiency
Montenegro	IPER - Institute for Entrepreneurship and Economic Development
Kosovo*	INDEP – Institute for Development Policy
Bosnia	Enova
Romania	Energy Policy Group
Bulgaria	Center for the Study of Democracy
Greece	FACETS

Timing of WPs

		July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	Apr	May	June
Work Package 1: Project coordination													
Task 1.1	Project administration												
Task 1.2	Local partner coordination												
Task 1.3	Supplementary activity coordination (event management)												
Task 1.4	Kick off meeting	●											
Work Package 2: Model development													
Task 2.1.	Electricity model development												
Task 2.2.	Gas market model development												
Work Package 3: Scenario assessment													
Task 3.1	RES model (GREEN-X) scenario assessment												
Task 3.2	Network model assessment												
Task 3.3	Scenario definition regional meeting			▪									
Task 3.4	2050 decarbonisation scenarios assessment				◊a								
Work Package 4: Regional Roadmap													
Task 4.1	Macroeconomic assessment												
Task 4.2	Roadmap report writing										◊b		
Task 4.3	6 country fact sheets writing										◊c		
Work Package 5: Capacity building - training workshops													
Task 5.1	Training workshop 1: Renewable energy support schemes					▪							
Task 5.2	Training workshop 2: Infrastructure CBA						▪ ○						
Work Package 6: Communication activities													
Task 6.1	High executive representatives meeting												
Task 6.2	Closing workshop											○ ◊d	
Task 6.3	Web design and maintenance												

●	Kick off	◊	deliverables
▪	Local workshops	○	project meeting

◊a	report on the selected scenarios
◊b	Regional Roadmap
◊c	country fact sheets
◊d	summary of the closing workshop

Deliverables

- 2050 decarbonisation scenario definition finalised at the kick-off meeting (September, Belgrade): all partners
- Trainings (2 in each topic for the 2 country group):
  - RES support schemes (Nov. 2016 – Podgorica, Jan. 2017 – Athens)
  - Infrastructure assessment (Dec. 2016 – Tirana, Febr. 2017 – Sofia)
- Country policy briefs: brief results at the national level
- Regional Electricity Roadmap (for the SEE region)
- Closing workshop (May 2017, Vienna)

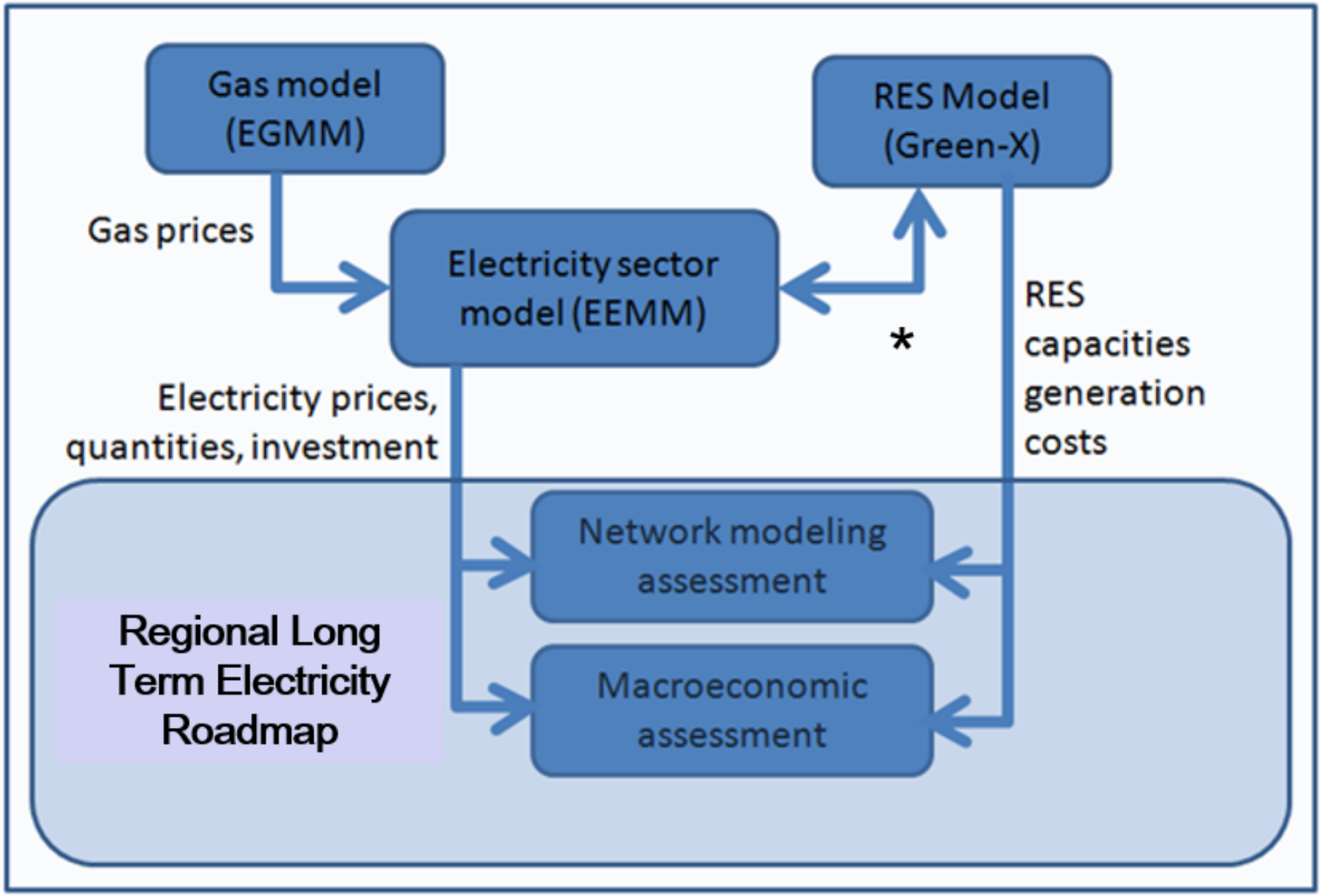
REKK Regional Centre for Energy Policy Research

MODELLING

Modelling approach

- **Objective**: draw realistic an ambitious decarbonisation roadmap for the SEE electricity sector in the timeframe of 2050
  - **Ambitious**: in the range of 93-99% decarbonisation (EU Roadmap 2050)
  - **Realistic**: calibrated models with proven regional background/reference
- **Scenario assessment** with the interlinkage of detailed bottom-up models:
  - European Electricity Market Model (EEMM) and European Gas Market Model (EGMM) - REKK
  - GREEN-X – TU Wien
  - Regional network model - EKC
- Analysing three scenarios:
  - Reference: continuation of present trends and policies
  - Full decarbonisation: reaching 2050 climate target
  - Delayed decarbonisation scenarios: reaching 2050 climate target
- And additional sensitivity analysis

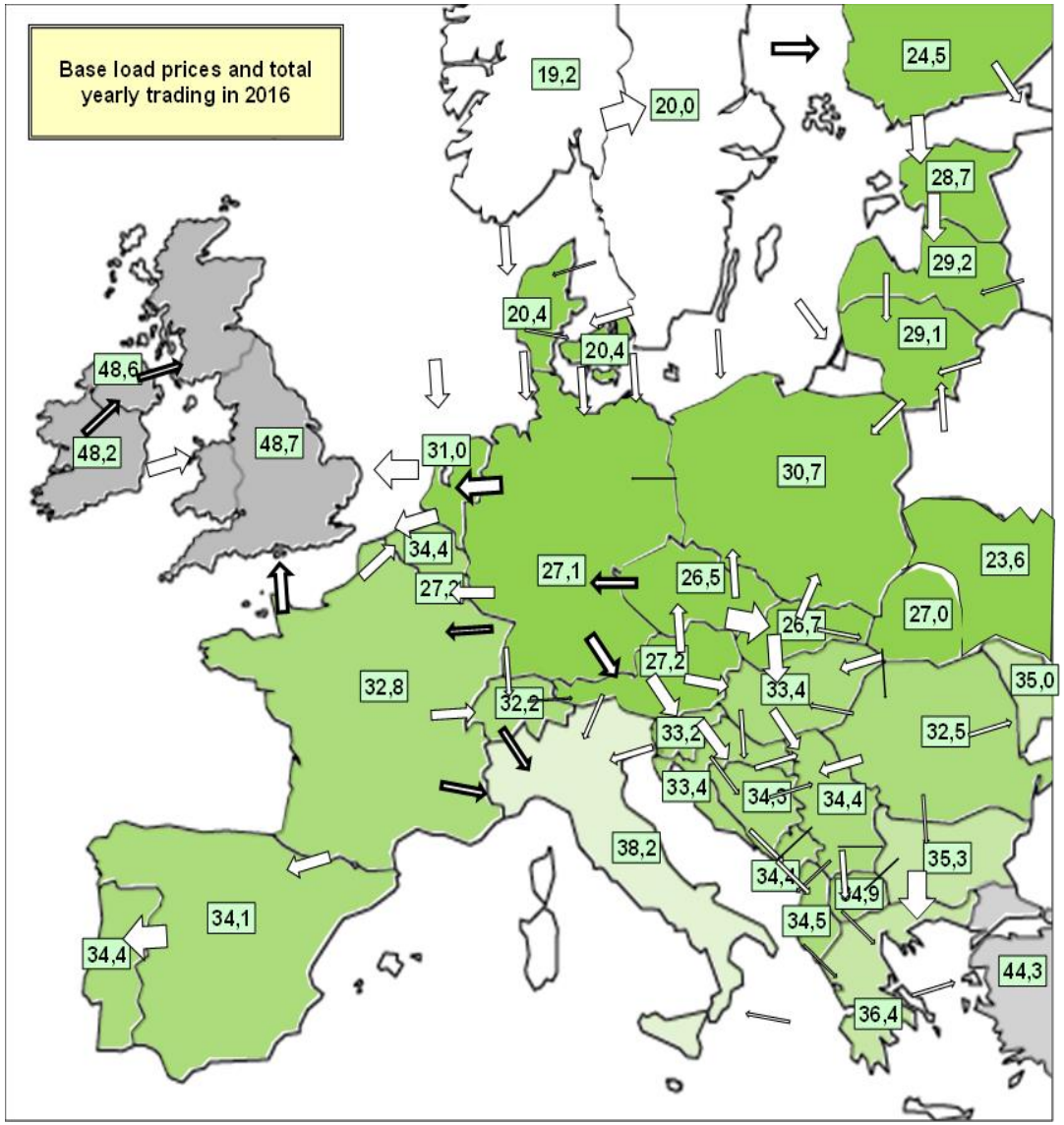
Model interlinkages



Model interlinkages

- EGMM → EEMM:
  - Gas price
  - Gas market end electricity model harmonisation on prices and quantities: bi-directional link
- EEMM ↔ Green-X:
  - Iterative process to define the technology mix (RES, CCS and other), which reaches the 2050 decarbonisation target
- EEMM → EKC:
  - From EEMM to EKC: supply (generation capacity/production)
- EEMM → macro:
  - Generation investment cost, network development cost

EEMM



►The map shows the main results of the model:

- Competitive market equilibrium prices by countries
- Electricity flows and congestions on cross-border capacities

►39 countries countries are handled in the model.

►Morocco, Tunisia, Russia and Belarus are considered as exogenous markets. In these markets the net export position are equal with the fact in 2014.

►Power flow is ensured by 99 interconnectors between countries.

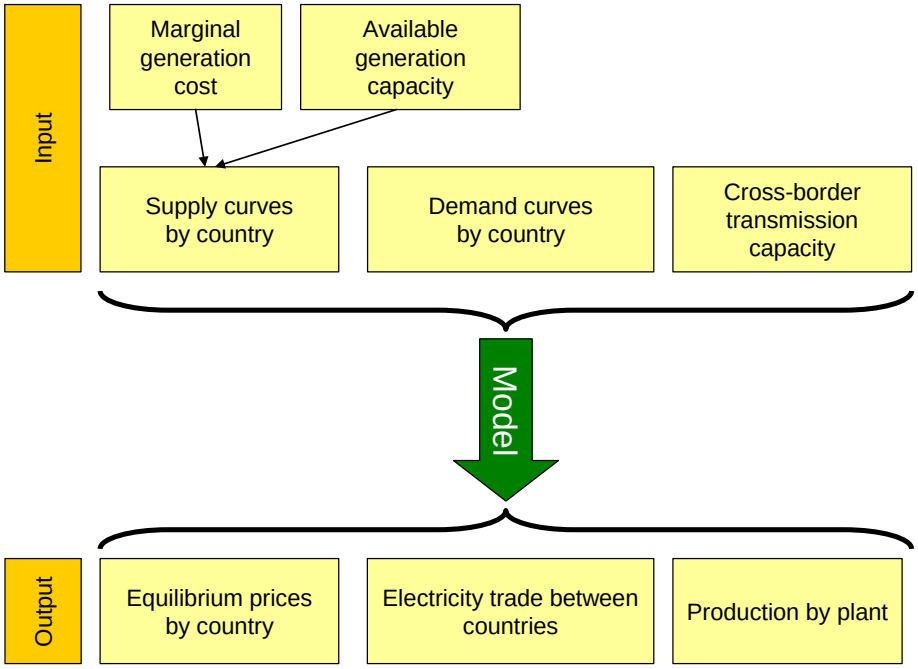
►The model calculates the marginal cost of around 3400 power plant blocks and sets up the merit order country by country.

►Taking into consideration the merit order and exports/import, the model calculates equilibrium prices.

12

Economic description and main assumptions

Main inputs and outputs of the model



►The model calculates regional power supply – demand balance at certain capacity and import/export constraints

►Demand evolution, power plant capacities, availability and cross border power flow defines market price

►Fuel prices are estimated based on available information

Main model assumptions

►The applied model is a partial equilibrium microeconomic model in which a homogeneous product is traded in several neighboring markets.

►Production and trade are perfectly competitive, there is no capacity withholding by market players.

►Production takes place in capacity-constrained plants with marginal costs and no fixed cost.

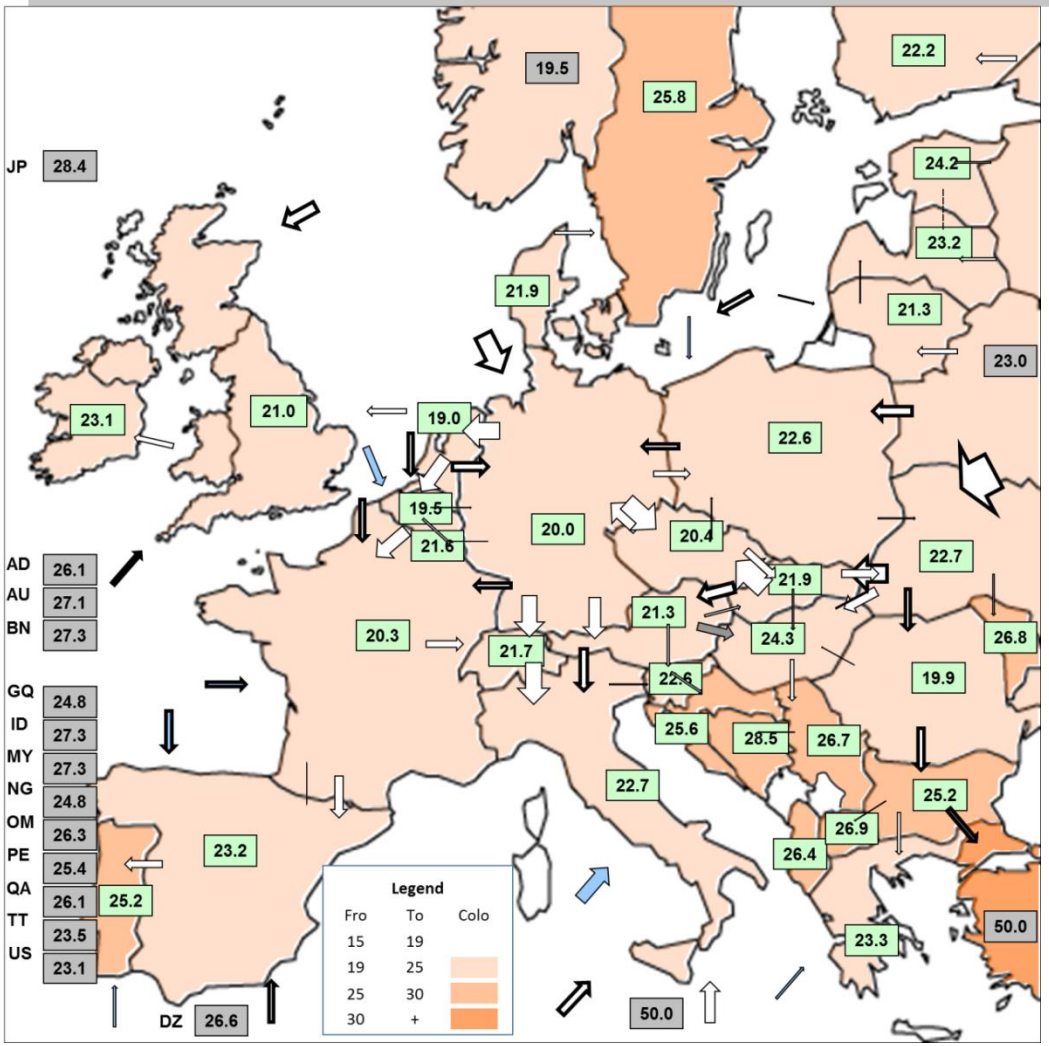
►Electricity flows are modeled as bilateral commercial arrangements between markets with a special spatial structure.

►Power flows on an interconnector are limited by NTC values in each direction.

►Fuel prices reflect power plant gate prices, transportation/ transmission costs are taken into consideration.

►Only ETS countries buy CO_2 allowances

EEGM scope and functionality



- 35 countries
- Competitive prices by countries; price modelled on monthly basis
- Trade is based on long term contracts and spot trade within the EU and with exogenous countries and global LNG market (NO, RU, TR, LNG)
- Natural gas flows and congestions on interconnectors
- Physical constraints are interconnection capacities (transmission tariffs are also included)
- Trade constraints: TOP obligations with flexibility
- Domestic production and storage facilities are included
- Arrows: modelled gas flows
- LNG market representation is linked to Asian LNG prices

REKK Regional Centre for Energy Policy Research

DIALOGUE PROCESS

Aims

- To convey key messages on the energy transition to decision-makers
- Focus in particular on issues which are in the focus of the decision makers:
  - Electricity price
  - Investment and O&M costs
  - Macro-economic impacts
  - Power system reliability
  - Net electricity import position
- Draw attention to the cost of relying heavily on coal/lignite
  - Impact on GHG emissions
  - Stranded investment costs due to increasingly stringent climate targets

Tools

- Provide venues of informal interaction for opinion leaders via workshops and regional meetings to enhance cross-sectoral and regional dialogue
- Engage local think tanks to drive a national fact-based dialogue based on the analytical results of SEERMAP
- Provide training for TSOs, regulators and ministry staff organised by ERRA and REKK
- Engage in active outreach towards potential allies on the multilateral/international level

Building regional capacity and cooperation

- Regional workshop on scenario definition
  - Participation of local think tanks and policy makers
  - Discussion on and finalisation of the decarbonisation scenarios
- Trainings
  - Targeted at ministries, think tanks, regulators and TSOs
  - Focus on regulatory issues, one on network pricing and the other on good practice in RES support policies
  - With assistance from ERRA
- Present analytical results of the project at high political level via country visits
- Closing workshop
  - Targeted at all participants
  - Present analytical results of the project at high political level as well as to experts
  - Involve Energy Community Secretariat, meeting to be organised in Vienna

All regional events to promote informal interaction and cooperation among regional actors

Local think tanks

- 1 TT per country, selected based on past work on energy sector
- Tasks:
  - Assist the modelling with input data (data validation)
  - National dissemination of SEERMAP results
  - Engaging with experts and policy makers
  - Promotion of SEERMAP results at high level
  - Providing feedback on national priorities and concerns to SEERMAP consortium
- Impact:
  - Building TT capacity
  - Building regional interaction among TTs with similar agendas
- Aim: Maintain TT Network after SEERMAP and have its own life with both regional and domestic focuses

Partners and contacts

Partner organisation	Contact person	email
REKK	László Szabó Zsuzsa Pató	laszlo.szabo@rekk.hu zsuzsanna.pato@rekk.hu
TUV	Gustav Resch	resch@eeg.tuwien.ac.at
OG Research	Mihály Kovács	mihaly.kovacs@ogresearch.com
EKC	Slobodan Markovic	slobodan.markovic@ekc-ltd.com
ERRA	Krisztina Kasza	krisztina.kasza@erranet.org

Reporting obligation of REKK

	Implementation Period	Deadline for Reporting
Start of project	1 July 2016	
Year 1 (month 1-5)	1 July 2016 – 30 November 2016	31 December 2016
Output 1	Report on selected scenarios	
Output 2	Training in renewable support policies	
Year 1 (month 6-9)	1 December 2016 – 31 March 2017	30 April 2017
Output 3	Training on infrastructure assessment	
Year 1 (month 10-12)	1 April 2017 – 30 June 2017	
Output 4	Country fact sheets	
Output 5	Closing workshop	
Output 6	Regional Electricity Roadmap	
End of project	30 June 2017	31 July 2017